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10/681,445

10/08/2003

Sung Mao Wu

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07/01/2004

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EXAMINER

PAREKH, NITIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 07/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/681,445

Applicant(s)

WU ET AL

Examiner

Nitin Parekh

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 October 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims.

A. The limitations as recited in claim 5, line 1 include "a heat sink disposed on the backside of the semiconductor chip".

Therefore, the heat sink must be shown on the backside of the chip 220 (see Fig. 2 and 3) or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of

any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Marrs et al. (US Pat. 5583378).

Regarding claims 1-4 and 6, Marrs et al. disclose a flip chip package/FCP (Fig. 3) comprising:

- a substrate (308 in Fig. 3) having an upper surface and a lower surface, the substrate comprising:

- a recessed cavity (see Fig. 3) defined in the upper surface of the substrate, the substrate comprising a reinforcement-containing insulating layer made of BT (bismaleimide-triazine) resin (see Col. 8, line 33) and having a thermal conductor/metal coating formed on the lower surface of the substrate (304 in Fig. 3; Col. 11, lines 40-54) and a plurality of

- conductive vias formed through the reinforcement-containing insulating layers (not numerically referenced in Fig. 3 - see 220 in Fig. 2A; Col. 8)
- a plurality of chip contact pads/conductive traces (324/338 in Fig. 3) formed on the surface of the reinforcement-containing insulating layer and exposed from the recessed cavity
- a plurality of electrical contacts/solder pads (not numerically referenced in Fig. 3-see 216 in Fig. 2A; Col. 8, lines 55-67) formed on the upper surface of the substrate and outside the recessed cavity for making external electrical connections, wherein the chip contact pads are electrically connected to the solder pads
- a semiconductor chip (302 in Fig. 3) disposed in the recessed cavity of the substrate by flip chip bonding and mechanically and electrically interconnected to the chip contact pads of the substrate via solder balls/joints (not numerically referenced in Fig. 3-see 216 in Fig. 2A; Col. 8, line 55- Col. 9, line 13), and
- an underfill epoxy (326 in Fig. 3) formed between the semiconductor chip and substrate

(Fig. 3; Col. 12, line 7- Col. 13, line 13; Col. 8-12).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marrs et al. (US Pat. 5583378).

Regarding claim 5, Marrs et al. teach substantially the entire structure as applied to claim 1 above, except the FCP comprising a heat sink disposed on the backside surface of the semiconductor chip.

Marrs et al. further teach another embodiment (see Fig. 4K) where a metal lid/heat sink (460K) is disposed on the backside surface of the chip to improve thermal dissipation/performance (Col. 16, lines 30-42).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the heat sink on the backside surface of the semiconductor chip so that thermal dissipation can be improved in Marrs et al's FCP.

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marrs et al. (US Pat. 5583378) in view of Malladi (US Pat. 6351389).

Regarding claim 7, Marrs et al. teach substantially the entire structure as applied to claim 1 above, except the reinforcement-containing insulating layer of the substrate being formed from FR-4 fiberglass reinforced epoxy resin.

Malladi teaches using a substrate (6 in Fig. 2) for a FCP including a variety of material including a conventional fiberglass reinforced epoxy resin/FR4 (Col. 4, lines 13-17).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the reinforcement-containing insulating layer of the substrate being formed from FR-4 fiberglass reinforced epoxy resin as taught by Malladi so that the rigidity and reinforcement can be improved in Marrs et al's FCP.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Art Unit: 2811

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

NP

06-26-04



NITIN PAREKH

PATENT EXAMINER

TECHNOLOGY CENTER 2800